

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.: 09/775,069
Filing Date: February 1, 2001
Applicant: Gerard A. Mourou
Group Art Unit: 1725
Examiner: Geoffrey S. Evans
Title: METHOD OF CONTROLLING CONFIGURATION OF
LASER INDUCED BREAKDOWN AND ABLATION
Attorney Docket: 2115D-000939/DVD (UofM Ref. No. 939rld2)

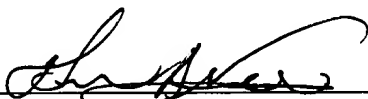
DECLARATION OF JOHN NEES SUBMITTED
UNDER 37 C.F.R. § 1.132

I, John Nees hereby state and declare as follows:

1. I received my Bachelor of Science in Physics from Kansas State University and a Master of Science in Optics from the University of Rochester in Rochester, New York.
2. I have been employed by the University of Michigan as a research scientist for ultra fast optics at the University of Michigan Center for Ultra Fast Optical Science since 1988. I have been named as a joint inventor on several patents, I am the co-author in over 30 publications and I have been a presenter or joint presenter at several conferences; my curriculum vitae is attached. (Attachment I)
3. I have read and understood USPN 5,656,186, the Office Action dated March 15, 12005 and the Response to the Office Action being submitted herewith.

4. I have carefully reviewed the Response to the Office Action in the present application, and hereby verify that, to the best of my information and belief, the factual assertions set forth therein are correct and complete, and I am also in complete agreement as to the opinions expressed therein, particularly as to the various methods described to achieve sufficient fluence on or in material by concentrating energy as described therein with specific reference to USPN 5,656,186, alternative to focusing, lens and/or Gaussian.

5. All statements made above of my own knowledge are true, that all statements made above on information and belief are believed to be true, and that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under Title 18 United States Code Section 1001, and may jeopardize the validity of above-identified application or any patent issuing therefrom.



John Nees

9/8/2005

Date

CURRICULUM VITAE

JOHN A. NEES

Citizenship: U.S.A.

Education

M.S., Optics The Institute of Optics, University of Rochester, Rochester, NY, 1985.

B.S., Physics Kansas State University, 1983.

Professional Experience

Associate Research Scientist, Center for Ultrafast Optical Science, University of Michigan, Ann Arbor, Michigan, November 2001 to present.

Assistant Research Scientist, Center for Ultrafast Optical Science, University of Michigan, Ann Arbor, Michigan , November 1995-November 2001.

Senior Associate Research Engineer, Ultrafast Science Laboratory, University of Michigan, Ann Arbor, Michigan , September 1988 - November 1995.

Laboratory Engineer, Laboratory for Laser Energetics, University of Rochester, Rochester, New York, September 1985 - August 1988.

Research Assistant, Laboratory for Laser Energetics, University of Rochester, Rochester, New York, August 1984 - September 1985.

Engineer in Training, United Technologies Research Center, East Hartford, Connecticut, January - August 1984.

Research Interests

John Nees is currently the director of the λ^3 relativistic laser laboratory at the Center for Ultrafast Optical Science. His research is aimed at making precision studies of Relativistic Optics including ultrafast x-ray sources, attosecond physics, high-harmonic generation, and electron and ion acceleration. One application of this work is the possible production of positrons with sub-picosecond synchronization. He also collaborates with groups involved in laser-based materials growth and micromachining.

Professional responsibilities

Director of the relativistic lambda cubed lab at the University of Michigan:

Responsibilities include managing graduate students, post doctoral scholars, and visiting research scientists to develop applications of extremely intense light. This includes daily lab meetings, weekly group meetings, preparation of publications, and conference presentations, reporting of research results to funding agencies and contract monitors, preparation and evaluation of research proposals and securing intellectual property.

Consulting

Huron Valley Steel Corp: Laser based materials analysis

Picometrix Inc: Optoelectronic instrumentation prototyping

International Collaborators:

Ferenz Krausz, Director of the Max Plank Institute for Quantum Electronics, Germany: attosecond science

Daniel Kaplan, former director of research at Thomson CSF, France, currently COE of Fastlite, streak camera technology, photoconductive switching, active phase control of femtosecond pulses

Pierre Turnois formerly of Thomson CSF, currently of Fastlite, France: devices for chirped pulse amplification, active phase control of femtosecond pulses

Jean-Claude Kieffer, director of the Petawatt laser project INRS, Canada: laser-based x-rays and high-harmonic generation

Shinichi Wakana of Fujitsu Laboratories, Japan: Electro-optic and photoconductive switches and sub-micron ultrafast circuit testing

Shuntaro Watanabe Professor of Toklyo University: wavefront control for enhancement of nonlinearities using ultrafast pulses

Sadhiro Takuma, former director of Kansai Research Establishment: High saturation fluence laser development

Hajime Nishioka, professor of University for Electro Communications, Japan: ultrasonic damage detection and Yb-base lasers. Patric George and Frederic Druon, Optics Institute France: Yb-based laser materials development

Nam, Korea: Carrier-Envelope phase stabilization.

Selected Publications

“Phase-matched enhancements of high-harmonic soft X-rays by adaptive wave-front control with a genetic algorithm,” D. Yoshitomi, J. Nees, N. Miyamoto, T. Sekikawa, T. Kanai, G. Mourou, S. Watanabe, Appl. Phys. B-Lasers Opt., **78**, 275 (4 March, 2004).

“Dependence of hard x-ray yield on laser pulse parameters in the λ^3 regime,” B. Hou, J. Nees, W. Theobald, G. A. Mourou, L-M Chen, J-C Kieffer, A. Krol, C. C. Chamberlain, Appl. Phys. Lett. **84**, 13 2259-61, (29 March 2004).

“Isolated attosecond pulses generated by relativistic effects in a wavelength-cubed focal volume,” N. M. Naumova, J. A. Nees, B. Hou, G. A. Mourou, and I. V. Sokolov, Opt. Lett. **29**, 778 (2004).

“Relativistic generation of isolated attosecond pulses in a λ^3 focal volume,” N. M. Naumova, J. A. Nees, I. V. Sokolov, B. Hou, and G. A. Mourou, Phys. Rev. Lett. **92**, (2004).

“High resolution hard x-ray spectroscopy of femtosecond laser-produced plasmas with a CZT detector,” L-M. Chen, P. Forget, R. Toth, J-C Kieffer, A. Krol, C.C. Chamberlain, B. Hou, J. Nees, G. Mourou., Rev. Scientific Instr., **74**, 12, 5035-8 (Dec. 2003).

“Direct measurement of the photoelectric response time of bacteriorhodopsin via electro-optic sampling,” Xu, J. (Dept. of Electr. Eng. & Comput. Sci., Michigan Univ., Ann Arbor, MI, USA;); Stickrath, A.B.; Bhattacharya, P.; Nees, J.; Varo, G.; Hillebrecht, J.R.; Ren, L.; Birge, R.R. Source: Biophysical Journal, v **85**, n 2, Aug. 2003, p 1128-34.

“Electron acceleration by few-cycle laser pulses with single-wavelength spot size,” Dudnikova, G.I. (Inst. of Comput. Technol., Novosibirsk, Russia;); Bychenkov, V.Yu.; Maksimchuk, A.; Mourou, G.; Nees, J.; Bochkarev, S.G.; Vshivkov, V.A. Source:

- Physical Review E (Statistical, Nonlinear, and Soft Matter Physics), v **67**, n 2, Feb. 2003, p 26416-1-7
- "Multi-diagnostic comparison of femtosecond and nanosecond pulsed laser plasmas," Zhang, Z. (Dept. of Electr. Eng. & Comput. Sci., Michigan Univ., Ann Arbor, MI, USA); VanRompay, P.A.; Nees, J.A.; Pronko, P.P. Source: Journal of Applied Physics, v **92**, n 5, 1 Sept. 2002, p 2867-74.
- "Directly diode-pumped Yb : KY(WO₄)(2) regenerative amplifiers" H. H. Liu, J. Nees G. Mourou, Opt. Lett. **27**, 9, 722-4 (1 May 2002).
- "Yb:KGd(WO₄)₂ chirped-pulse regenerative amplifiers," H. Liu, J. Nees, G. Mourou, S. Biswal, G.J. Spuhler, U. Keller, N. V. Kuleshov Optics-Communications. **203**, 3-6, 15 March 2002, p.315-21.
- "Epitaxial SnO₂ thin films grown on (1012) sapphire by femtosecond pulsed laser deposition," J. E. Dominguez, X. Q. Pan, L. Fu, P. A. Van Rompay, Z. Zhang, J. A. Nees, P. P. Pronko, Journal of App. Phys. **91**, no.3; 1 Feb. 2002; p.1060-5
- "On the design of experiments for the study of relativistic nonlinear optics in the limit of single-cycle pulse duration and single-wavelength spot size," G. Mourou, Z. Chang, A. Maksimchuk, J. Nees, S.V. Bulanov, N.M. Naumova, Vyu. Bychenkov, T.Zh. Esirkepov, F. Pegoraro, H. Ruhl, Plasma-Physics-Reports. **28**, 1, Jan. 2002; p.12-27(Translated from: Fizika-Plazmy, **28**, 1, Jan. 2002, p.14-31).
- "12-mJ, 350-fs Yb:GdCOB regenerative amplifier," F. Druon, F.Balembois, P. Georges, A. Brun, Seung Whan Bahk, J. Nees, G. Mourou, G. Cheriaux, J-P. Chambaret, G. Aka, D. Vivien Optics Comm. vol.199, no.1-4; 15 Nov. 2001; p.181-7
- "Diode-pumped Kerr-lens mode-locked Yb:KY(WO₄)₂ laser," H. Liu, J. Nees, G. Mourou, Optics-Letters. **26**, no.21; 1 Nov. 2001; p.1723-5.
- "Nitride Film Deposition by Femtosecond and Nanosecond Laser Ablation in Low Pressure Nitrogen Discharge Gas", Z. Zhang, P.A. VanRompay, J.A. Nees, R. Clarke, X. Pan, and P.P. Pronko, Applied Surface Science, **154-155**, 165 (2000).
- "Isotope enrichment in laser-ablation plumes and commensurately deposited thin films," P.P. Pronko, P. A. VanRompay, Z. Zhang, and J. Nees, Phys. Rev. Lett. **83**, 2596-2599 (1999).
- "Ultrafast ytterbium-doped bulk lasers and laser amplifiers," C. Honninger, R. Paschotta, M. Graf, F. Morier-Genoud, G. Zhang, M. Moser, S. Biswal, J. Nees, A. Braun, G. A. Mourou, I. Johannsen, A. Giesen, W. Seeber, U. Keller, Appl. Phys. B-Lasers Opt. **69**, 1, 3-17 (July 1999)
- "Directly diode-pumped millijoule subpicosecond Yb:glass regenerative amplifier," H. Liu, S. Biswal, J. Paye, J. Nees, G. Mourou, C. Hönninger, and U. Keller, Optics Lett. **24** (13), 1 July 1999, 917-9.
- "Ytterbium-doped glass regenerative chirped-pulse amplifier," S. Biswal, J. Nees, A. Nishimura, H. Takuma, G. Mourou, Opt. Commun. **160**, 92-7 (3 January 1999)
- "Wave-front correction of femtosecond terawatt lasers by deformable mirrors," F. Druon, G. Cheriaux, J. Faure, J. Nees, M. Nantel, A. Maksimchuk, J-C Chanteloup, G. Vdovin, Opt. Lett. **23**, 13, 1043-5 (1 July, 1998)

- "Ensuring compactness, reliability, and scalability for the next generation of high-field laser," J. Nees, S. Biswal, F. Druon, M. Nantel, G. Mourou, A. Nishimura, H. Takuma, J. Itatani, J. C. Chanteloup, and C. Hönniger, *IEEE Selected Topics in Quantum Electronics*, **4**, 2 March/April 1998, 376-84
- "Efficient energy extraction below the saturation fluence in a low-gain low-loss regenerative chirped-pulse amplifier," S. Biswal, J. Itatani, J. Nees, G. A. Mourou, *IEEE Selected Topics in Quantum Electronics*, **4**, 2 March/April 1998 421-5.
- "Temporal contrast in ti:sapphire lasers: characterization and control," M. Nantel, J. Itatani, A.-C. Tien, J. Faure, D. Kaplan, M. Bouvier, T. Buma, P. VanRompay, J. Nees, P. P. Pronko, D. Umstader, and G. Mourou, *IEEE Selected Topics in Quantum Electronics*, **4**, 2 March/April 1998.
- "A field-sensitive photoconductive probe for sampling through passivation layers," J. R. Hwang, R. K. Lai, J. Nees, T. B. Norris, J. F. Whitaker, *Appl. Phys. Lett.* **69**, 15, 2211-3 (7 October 1996).
- "A fiber-mounted, micromachined photoconductive probe with 15 nV/Hz(1/2) sensitivity" R. K. Lai, J. R. Hwang, J. Nees, T. B. Norris, J. F. Whitaker, *Appl. Phys. Lett.* **69**, 13, 1843-5 9 (23 September 1996).
- "Broad-bandwidth pulse amplification to the 10- μ J level in an ytterbium-doped germanosilicate fiber," D. T. Walton, J. Nees, G. A. Mourou, *Opt. Lett.* **21**, 14, 1061-3 (15 July 1996).
- "Ultrafast-ultrafine probing of high-speed electrical waveforms using a scanning force microscope with photoconductive gating," J. Nees, S. I. Wakana, S. Hama, *Opt. Quantum Electron.* **28**, 7, 843-65 (July 1996).
- "Compact, high power, modelocked upconversion laser using a thulium-doped ZBLAN fibre," L-M Yang, D. T. Walton, J. Nees, W. H. Weber, *Electron. Lett.* **32**, 7, 658-9 (28 March 1996).
- "High-speed metal-semiconductor-metal photodiodes with Er-doped GaAs," S. Sethi, T. Brock, P. K. Bhattacharya, J. Kim, S. Williamson, D. Craig, J. Nees, *IEEE Electron Device Lett.*, **16**, No. 3, March, 1995.
- "Photoconductive sampling probe with 2.3 ps temporal resolution and 4- μ V sensitivity", J. Kim, S. Williamson, J. Nees, S. Wakana, and John Whitaker, *Appl. Phys. Lett.* **62**, 18, (3 May 1993).
- "1.4 ps Risetime High-Voltage Photoconductive Switching," T. Motet, J. Nees, S. Williamson, G. Mourou, *Appl. Phys. Lett.*, **59**, 1455-1457, (1991).
- "100 GHz Traveling-Wave Electro-Optic Phase Modulator," J. Nees, G. Mourou, S. Williamson, *Appl. Phys. Lett.*, **54**, 1962, (1989).
- "Novel Method for Ultrahigh-Frequency Electro-Optic Time-Domain Reflectometry," T. Jackson, J. Nees, R. Vallee, and G. Mourou, *Elect. Lett.* **23**, 1130-1131 (October 1987).
- "Noncontact Electro-Optic Sampling with a GaAs Injection Laser," J. Nees and G. Mourou, *Electron. Lett.* **22**, 918-919 (August 1986).

Patents

"Electro-Optic Measurement (Network Analysis) System," #4,745,361, May 17, 1988.

"Scanning Probe Having Picosecond Temporal and Nanometer Spatial Resolution," #5,442,300, August 15 1995.

"Selectively Triggered High-Contrast Laser", #5,541,947, 1996.

"Method for Laser Induced Isotope Enrichment." # 6,586,696 July 1, 2003.

Scientific Service and Distinctions

Internal funding review for University of Michigan.

NSF proposal review panels: Biophysics, Sept. 1999, Lasers and LEDs March 2002, March 2003, and March 2004.

JASON committee review, July 2001.

Papers reviewed for Optics Lett., JOSA B, and Appl. Phys. Lett., J. Appl. Phys..

Invited speaker at Ultrafast Lasers for the Canadian Light Source, Michigan Economic Development Corporation, and The European Atto-Network Symposium, International Conference on UltraIntense Lasers.